REMARKS

This is a full and timely response to the Office Action mailed July 1, 2008, submitted concurrently with a two month extension of time to extend the due date for response to December 1, 2008.

By this Amendment, claims 1, 3, 6 and 8 have been amended to clarify the mathematical equation to calculate the viscosity of the silica sol. Thus, claims 1-12 are currently pending in this application. Support for the claim amendments can be readily found variously throughout the specification and the original claims.

In view of this response, Applicant believes that all pending claims are in condition for allowance. Reexamination and reconsideration in light of the following remarks is respectfully requested.

Objection to the Specification

The specification has been objected to for not disclosing how a concentration [C] in g/L multiplied by mPa-s results in a viscosity in terms of mPa-s. Applicant wishes to explain that the mathematical equation "*a viscosity from (0.12 x [C]) (or 0.06 x [C]) mPa•s to 15 mPa•s measured at 25°C under the SiO_2 concentration wherein [C] denotes a value of the SiO_2 concentration*" does not require the use of the concentration [C] in g/L. The mathematical equation only requires the "*numerical*" value of the SiO_2 concentration which, for example in claim 1, is from 15 to 50. Hence, Applicant believes that the above explanation overcomes this objection since the specification when read in view of the above is clear on its face.

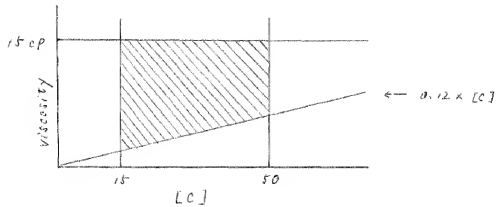
Rejection under 35 U.S.C. §112

Claim 1-7 are rejected under 35 U.S.C. §112, second paragraph, for allegedly being indefinite. Applicant believes that the comments above and herein below overcome this rejection by clarifying that the range of viscosity is calculated using a formula ("*0.12 x [C]*" and "*0.06 x [C]*") wherein [C] denotes the "*numerical*" value of the SiO_2 concentration (see sentence bridging pages 3 and 4 of the specification).

As stated above, the mathematical equation ("*0.12 x [C]*" and "*0.06 x [C]*" *wherein [C] denotes the value of the SiO_2 concentration*) used to calculate the range of viscosity in the claims, does not require the use of the concentration [C] in g/L. The mathematical equation only requires the "*numerical*" value of the SiO_2 concentration.

As explained in Applicant's response filed May 19, 2008 which has been reiterated herein below for the Examiner convenience, the required properties of the silica sol were found by the Applicants during experiments. The inventors plotted a graph, with the concentration as abscissa and the viscosity as ordinate. The requirements "*with a SiO_2 concentration from 15 to 50 g/L and a viscosity from (0.12 x [C]) mPa•s to 15 mPa•s measured at 25°C under the SiO_2 concentration, wherein [C] denotes a numerical value of the SiO_2 concentration*" mean the area defined by the following four lines on the coordinate:

X = 15 (g/L)
X = 50 (g/L)
Y = 0.12X (mPa·s) (In this equation, X = [C].)
Y = 15 (mPa · s)



In other words, the silica sol defined in claim 1 has a viscosity within the area of the oblique lines above which is defined by the numerical value of the SiO_2 concentration [C]. Hence, the unit of "g/L" is not multiplied by "mPa•s" to result in the viscosity in terms of mPa•s as understood by the Examiner.

Thus, Applicant believes that the properties of the silica sol, which are defined by its concentration limits and viscosity limits, can be clearly understood by one skilled in the art, since [C] within the mathematical equation only denotes the "*numercal*" value of the SiO_2concentration.

Nevertheless, to clarify the claims in view of the comments above, Applicant has amended claims 1, 3, 6 and 8 to clearly indicate that the variable "*[C]*" in the mathematical equations of *(0.12 x [C]) mPa•s* and *(0.06 x [C]) mPa•s* denotes only a "*numercal*" value from "*15 to 50*" or "*100 to 200*" as well as indicate that the value corresponds to the SiO_2 concentration of the silica sol.

Thus, in view of the comments above and the foregoing claim amendments, Applicant respectfully submits that this rejection can no longer be sustained and should be withdrawn.

Rejection under 35 U.S.C. §102

Claims 1, 2, 4, 6 and 7 are rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Keiser et al. (U.S. Patent No. 6,372,089). Applicant respectfully traverses this rejection.

To constitute anticipation of the claimed invention under U.S. practice, the prior art reference must literally or inherently teach each and every limitation of the claims. Here, in this case, Applicant believes that Keiser et al. fails to teach all the limitations of the claims with particular emphasis on the limitations "*a silica sol with a SiO_2 concentration from 15 to 50 g/L and a viscosity from (0.12 x [C]) mPa•s to 15 mPa•s measured at 25°C under the SiO_2 concentration, wherein [C] denotes a value from 15 to 50 which corresponds to the SiO_2 concentration of the silica sol*", and "*diluting the high concentration silica sol prior to storage*".

In the Office Action, the Examiner has maintained the rejection of claims 1, 2, 4, 6 and 7 as being anticipated by Keiser et al. on the basis that the reference teaches (1) silica sol concentration of from 7 to 20 percent by weight (see column 3, lines 1-13 of Keiser et al.) and (2) in Example 3, a silica sol having a viscosity of 2.9 centipoises and a pH of 2.76 (see column 11, lines 37-38 of Keiser et al.). The Examiner believes that such teachings of Keiser et al. read on the limitations of the claims. However, for the same reasons as that presented in the response filed May 19, 2008, Applicant strongly disagrees with the Examiner in this regard.

Applicant's representative has reviewed with the Examiner the arguments previously submitted in the response filed May 19, 2008 during telephone interviews. In view of the telephone discussions with the Examiner, the Examiner has kindly agreed to reconsider his position based on the previously submitted arguments. Thus, Applicant has reiterated herein below the arguments submitted May 19, 2008.

Applicant wishes to emphasize that the properties noted by the Examiner in support of his position are those of an aqueous silicic acid, which is a reactant, and not a product. This reactant, aqueous silicic acid, is not a colloidal silica sol that is used in the production of paper. Thus, the properties of the aqueous silicic acid are not comparable or relevant to the properties of the silica sol of the present invention.

Further, the properties of this aqueous silicic acid do not satisfy the property limitations recited in claim 1. Specifically, the concentration in g/L of this aqueous silicic acid, calculated from the SiO_2 concentration of 6.37% by weight and the specific gravity of 1.0388 written in column 11, lines 37-38, of Keiser et al., is 66.17 g/L (6.37 x 1.0388 = 6.617g/100ml = 66.17 g/L) which is outside the claimed range of 15 to 50 g/L defined in the claims. Moreover, the measured actual viscosity of the aqueous silicic acid, 2.9 centipoises (2.9 centipoises = 2.9 mPa•s), is also outside the claimed range of (0.12 x [C]) mPa•s to 15 mPa•s defined in the claims. In order for the viscosity of the aqueous silicic acid to satisfy the requirements of claim 1, the viscosity must be at 7.94 mPa•s, calculated from the concentration value of 66.17 g/L and the mathematical formula recited in the claims ((0.12 x 66.17) = 7.94 mPa•s). However, the measured actual viscosity of the aqueous silicic acid of 2.9 mPa•s is outside the viscosity range defined by the mathematical formula, i.e. 7.94 mPa•s to 15 mPa•s. Thus, it is clear that the SiO_2 concentration and the viscosity of the aqueous silicic acid or reactant of Keiser et al. do not satisfy the requirements of the claims.

It should also be further noted that the properties of the product of EXAMPLE 3, i.e. a colloidal silica composition for use in the production of paper, are found in column 11, lines 55-59, of Keiser et al. The disclosed colloidal silica composition has a silica concentration of 14.8-16.6% by weight and a specific gravity of 1.1033. The SiO_2 concentration of such a product in g/L, calculated from these data, is from about 163 to 183 g/L (14.8 x 1.1033 = 16.329g/100ml = 163.29

g/L and 16.6 x 1.1033 = 18.315g/100ml = 183.15 g/L) which is much higher than the SiO_2 concentration of the silica sol as a final product (i.e. 15 to 50 g/L) of claims 1, 2 and 4.

Similarly, the retention aid of claim 6 has a low SiO_2 concentration from 15 to 50 g/L, but shows a high viscosity. In contrast, the colloidal silica composition, used as a retention aid, obtained in EXAMPLE 3 of the Keiser et al. has a high SiO_2 concentration from 163 to 183 g/L. Therefore, the concentration of the retention aid of claim 6 is different from that of Keiser et al. If Keiser et al.'s colloidal silica composition, which does not show an increase in the viscosity even at the high concentration (which will be explain herein below), is diluted to such a low concentration of 15 to 50 g/L, the viscosity will be much lower than in the present claims.

In addition, the colloidal silica composition having a SiO_2 concentration of from 7 to 20 percent by weight disclosed in column 3, lines 1-13 of Keiser et al. is also outside the SiO_2concentration range (i.e. 15 to 50 g/L) of the present invention. Based on the Applicant's calculation, a SiO_2 concentration of 7.00% by weight results in a SiO_2 concentration of 70 g/L (7g/100g = 70g/1000g = 70g/L, since 1000g is 1 L). The same can obviously be concluded for the SiO_2 concentration of 20.00% by weight (20g/100g = 200g/1000g = 200g/L, since 1000g is 1 L).

Hence, since Keiser et al. fails to teach a silica sol and retention aid with the properties specified in claims 1, 2, 4, 6 and 7, these claims are neither anticipated by nor obvious over the teachings and suggestions of Keiser et al. Thus, for these reasons, withdrawal of the present rejection is respectfully requested.

Rejection under 35 U.S.C. §103

Claims 3, 5 and 8-12 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Keiser et al. (U.S. Patent No. 6,372,089). Applicants respectfully traverse this rejection.

To establish a *prima facie* case of obviousness, the cited reference must teach or suggest the invention as a whole, including all the limitations of the claims. Here, in this case, Keiser et al. fails to teach or suggest the claim limitations "*a silica sol with a SiO_2 concentration from 15 to 50 g/L and a viscosity from (0.12 x [C]) mPa•s to 15 mPa•s measured at 25°C under the SiO_2 concentration, wherein [C] denotes a value from 15 to 50 which corresponds to the SiO_2*

concentration of the silica sol", "*preparing a high concentration silica sol which has a high SiO_2 concentration ranging between 100 g/L and 200 g/L, and has a viscosity from (0.06 x [C]) mPa•s to 30 mPa•s measured at 25°C under the high SiO_2 concentration, wherein [C] denotes a value from 100 to 200 which corresponds to the high SiO_2 concentration of the silica sol*", "*diluting the high concentration silica sol prior to storage*", and "*the silica sol is further diluted before adding to the pulp slurry*".

As discussed during the telephone interviews with the Examiner, Applicant believes that the Examiner is incorrect for maintaining the rejections and respectfully requests that the Examiner reconsiders his position in view of Applicant's previously submitted arguments which have been reiterated herein below for the Examiner's convenience. Applicant's representative wishes to thank the Examiner for his courtesy in agreeing to reconsider his position in view of the previously submitted arguments.

First, claims 3 and 5 depend from claims 1 or 2 and include all of the features of claim 1 or 2. Thus, the dependent claims are allowable at least for the reasons claim 1 or 2 is allowable (see above) as well as for the features they recite.

Further, it is important to emphasize that the final product of the colloidal silica composition of Keiser et al. has a high concentration of silica (163 to 183 g/L as calculated above). As discussed in Example 3 of Keiser et al., the reactant of aqueous silicic acid is processed through ultrafiltration to increase the concentration of the silica to 14.8 - 16.6 % in the final colloidal silica composition.

In contrast, in claims 3 and 5, a silica sol having a high SiO_2 concentration ranging between 100 g/L and 200 g/L is first prepared. Then, the silica sol is diluted prior to storage. It is from this diluted silica sol which is used in claim 1 to obtain the final silica sol for the papermaking method. Thus, it is clear that the final silica sol of the present invention (i.e. "*a silica sol with a SiO_2 concentration from 15 to 50 g/L and a viscosity from (0.12 x [C]) mPa•s to 15 mPa•s measured at 25°C under the SiO_2 concentration, wherein [C] denotes a value from 15 to 50 which corresponds to the SiO_2 concentration of the silica sol*") is different from the final colloidal silica composition of Keiser et al. (i.e. *a silica sol with a SiO_2 concentration from 163 to 183 g/L* or *70 to 200 g/L*).

Applicant also submits that Keiser et al. fails to teach diluting the resulting high-concentration product. High concentration silica sol according to the present invention is very unstable and apt to polymerize further. Therefore, if this high concentration silica sol is stored as is, it will gel and become useless in a short time. In other words, it is too late if such high concentration silica sol is diluted just before the addition to pulp slurry. It has to be diluted prior to storage. Since a high concentration silica sol tends to further polymerize as mentioned above, it will accelerate polymerization and then production. The produced high concentration silica sol is diluted subsequently, in order to prevent its further excessive polymerization and allow its stable storage.

Applicant wishes to direct the Examiner's attention to page 8, third paragraph, of the present specification which explains the importance of the SiO_2 concentration range of 100 g/L to 200 g/L. Further, the importance of diluting silica sol to the SiO_2 concentration of 15 g/L to 50 g/L for storage is explained in the second full paragraph on page 9 of the specification.

Applicant wishes to reiterate and emphasize to the Examiner that Keiser et al. is completely silent about diluting their colloidal silica composition. In fact, the colloidal silica composition of Keiser et al. does not require diluting (please see the last sentence of EXAMPLE 3 in Keiser et al.). It states that after 51 days, the surface was measured to be 711.2 m^2 /g, which implies that they were able to store the product stably for 51 days without dilution.

This fact actually shows the major difference between the high concentration silica sol of the present invention and the colloidal silica composition of Keiser et al. If the colloidal silica composition of Keiser et al. had been the same as the silica sol of the present invention, it would have gelled in a short time.

The inventors of the present invention believes that polymerization, the progress of which leads to an increase in the viscosity, seldom takes place in Keiser et al.'s colloidal silica composition. Although the colloidal silica composition has a high concentration of 163 to 183 g/L, it never polymerizes but remains just a "colloidal silica". In contrast, the high concentration silica sol of the present invention has high polymerizability. This high polymerizability makes it possible to produce a high concentration silica sol with a controlled polymerization degree, as well as in bulk in a short time.

With respect to the Examiner's argument in the office action that it would have been obvious to one skilled in the art to obtain silica sol of high concentration to save on transportation costs, Applicant believes that based on such logic, the skilled artisan would also have diluted silica sol of high concentration just before use to save on storage costs. However, it is clearly stated in previously amended claim 3 that the high concentration silica sol is diluted prior to storage to prevent excessive polymerization of the silica sol and allow for its stable storage. Therefore, it is clear that the production and dilution of the high concentration silica sol prior to storage is not done for economical reasons but for the technical reasons explained above. Hence, Applicant believes that the invention of amended claim 3 is not obvious from the disclosure of Keiser et al. based on the economical reasons noted by the Examiner.

Thus, for these reasons, withdrawal of the present rejection is respectfully requested.

With regard to claims 8-12, Applicant believes that these previously added claims are distinguishable from that which is disclosed in Keiser et al. for also the reasons noted above.

In the inventions of claim 8 and its dependent claims, aging, or polymerization carried out under high SiO_2 concentration produces polymers with polymerization degrees appropriate for the retention aid. Silica sol of high concentration is apt to polymerize further for the reasons explained above. The resultant high concentration silica sol including such ideal polymers is then diluted to a silica sol with a lower concentration, which will be stored or used. In contrast, Keiser et al. is completely silent about aging after preparing a high concentration silica sol precursor and a high concentration silica sol, produced through the aging, with excellent properties including the specified viscosity.

Therefore, Applicant submits that claim 8 and the claims dependent thereto (i.e. claims 9-12) are also patentable over Keiser et al.

CONCLUSION

For the foregoing reasons, all the claims now pending in the present application are believed to be clearly patentable over the outstanding rejections. Accordingly, favorable reconsideration of the claims in light of the above remarks is courteously solicited. If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the below-listed number.

Dated: November 26, 2008

Respectfully submitted,

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